APPENDIX 5

The OSLO Report

(Translation)

1. *Ju 88 Programme.* Ju 88 is a two-engined long-range bomber and it has the advantage of being able to be employed also as a dive-bomber. Several thousand of these, probably 5,000, are being produced monthly. By April 1940, 25–30,000 bombers of this type alone are expected to have been completed.

2. *The Franken.* The first German aircraft carrier is in Kiel harbour. It is expected to be completed by April 1940 and is named 'Franken'.

3. *Remote-controlled Gliders.* The German Navy is developing remote-controlled gliders, i.e. small aircraft of some three metres wing-span and three metres length which carry a large explosive charge. They have no engines and are cast off from an aircraft flying at a great height. They contain:

(a) an electric altimeter, similar to the wireless altimeter (Bell Syst. Tech.J. Jan 39.p.222). This causes the glider to pull out at a height of some three metres above the water. It then continues its flight under rocket propulsion.

(b) a remote-control apparatus using ultra short waves in the form of telegraphic signals by which the glider can be steered to the right or left or straight ahead, eg from a ship or from an aircraft. In this way the glider may be directed against the side of an enemy ship, when the explosive charge should fall and explode under water.

The secret code number is FZ 21 (Ferngesteuerte Zielflugzeug = remote-controlled target-aircraft). The testing range is at Peenemünde, at the mouth of the Peene, near Wolgast, near Greifswald.

4. *Autopilot.* A pilotless aircraft, code number FZ 10, is being developed at Diepensee near Berlin, which is to be controlled from a manned aircraft and used, for example, for the purpose of destroying balloon barrages.

5. *Remote-controlled Shells.* The Army Ordnance Department (HWA) is the testing place for the Army. This centre is concerned with the development of shells of 80 cm calibre. Rocket propulsion is being used, and stabilisation is secured by built-in gyros. The difficulty in using rocket propulsion is that the projectile does not fly straight but describes uncontrollable curves. It has therefore a remote control by means of which the rocket's jet is steered. This development is still in its early stages and the 80 cm shells are intended to be used later against the Maginot Line.

6. *Rechlin.* This is a small place on Lake Meuritz, north of Berlin. The laboratories and test range of the Luftwaffe are there, a rewarding target for bombers.

7. *Methods of Attack on Bunkers.* Experiences in the campaign against Poland have proved that against concrete gun-emplacements an ordinary direct attack is useless. The Polish gun-emplacements were therefore completely screened by smoke shells, so that the smoke screen hung lower and lower over the gun positions. The Polish gun crews were in this way compelled to withdraw into their bunkers. Close behind the smoke screen German flame-throwers came forward and took up positions in front of the bunkers. Against these flame-throwers the gun-emplacements were powerless, and their occupants either died or had to surrender.

8. *Air Raid Warning Equipment.* At the time of the attack by English airmen on Wilhelmshaven at the beginning of September the English aircraft were already sighted 120 km from the German coast. Along the whole length of the German coast are short-wave transmitters of 20 kw power which send out quite short pulses of 10^{-5} secs duration. These pulses are reflected by aircraft. Near to each transmitter there is a receiver, tuned to the same wave-length. After an interval the reflected pulse from the aircraft reaches the receiver and is recorded on the cathode-ray tube. From the interval between the transmission of the pulse and the reception of the reflected pulse the distance of the plane can be computed. Since the transmitted pulse is much stronger than the reflected pulse, the receiver is cut off while the transmission takes place. The transmitted pulse is marked on the cathode-ray tube by a local sign.

In connection with the Ju 88 – The programme [is] for such transmitters to be installed all over Germany by April 1940.

Countermeasures. By means of special receivers, which can register pulses lasting 10^{-5} to 10^{-6} seconds, the wave-lengths of the pulses transmitted in Germany must be determined and then interfering signals must be transmitted on the same wave-length. These receivers can be on the ground as well as the transmitters, since the method is very sensitive.

While this method as a whole is being introduced, there is another method in preparation, which works on 50 cm wave-length. See Fig. 1.* The transmitter T sends out short pulses which are narrowly directed by means of an electric dish. The receiver R stands immediately next to the transmitter and likewise has a direction antenna. It receives the reflected [pulses. The transmitter and receiver are connected by a]† wiring system whose transmission time is continually adjustable. This artificial circuit has the following object:

---

* The diagrams were not attached to the copy available.

† Line omitted in the copy available.

the receiver is normally turned off and can receive no signals. The pulse from T also runs along the artificial circuit and renders the receiver active for quite a short time. If the period of the pulse in the circuit is equivalent to the duration of the reflected pulse, the latter can be registered by the receiver on a cathode-ray tube. With this procedure the distance of, eg, an aircraft, can be estimated very precisely, and it is very resistant to interference, since the receiver is open only for a very short time.

9. *Aircraft Range-Finder.* When airmen fly to carry out an attack on a foreign country, it is important for them to know how far they are from their base. For this purpose the following procedure has been developed at Rechlin.

At the base there is a radio transmitter (6 m band) which is modulated at a low frequency 'f'. The aircraft, at a distance 'a' receives the 6 m wave and the low frequency f, after demodulation. With this low frequency it modulates its own transmitter which has a somewhat different wave-length. The adjusted frequency of the wave-length from the aircraft is received at the base and demodulated. The low frequency f thus received is compared with the local low frequency f. They differ by the phase angle 4π f.a/c (c = speed of light). By measuring the phase, one can measure the aircraft range, and one can inform the aircraft of its position. In order that the measurement should be unambiguous, the phase angle must equal 2π*, but with so low a frequency, one cannot obtain any great precision. Therefore at the same time one transmits a second, higher, frequency, eg 1500 pps and then compares its phase angle. So 150 pps as a rough measure and 1500 pps as a fine measure.

10. *Torpedoes.* The German Navy has two new kinds of torpedoes.

a) For instance when it is desired to attack convoys from 10 km. Such torpedoes have a wireless receiving apparatus which can receive three signals. With these signals the torpedoes may be steered either from the ship which fired it, or from an aircraft, to the right or left or straight ahead. Long wave-lengths, of the order of 3 km which penetrate well under water, are employed. These are modulated by short audio frequency signals which steer the torpedo. In this manner the torpedo may be guided to within close range of the convoy. In order actually to hit a vessel there are on the head of the torpedo two acoustic receivers which constitute a direction receiver. The torpedo's course is guided by this receiver so that it moves automatically towards the source of sound. If, therefore, the torpedo has been brought to within a few hundred metres of any ship, it automatically makes straight for that ship, since any ship makes acoustic noises because of its engines. By means of acoustic or radio jamming signals, it is comparatively easy to protect a ship.

---

* Footnote in the original: – to remain below 2π, one chooses, therefore a low frequency f, eg 150 pps and then the phase angle = 2π for 1,000 km exactly.

b) The second type of torpedo is probably the type which sank the *Royal Oak*. These do not strike the ship's side, but explode under the ship's bottom. The fuze is initiated magnetically, an effect based on the following principle: Fig 2. The vertical component of the magnetic field is everywhere approximately the same, but it is altered by the ship S so that the field is weaker at A and C and stronger at B. A torpedo coming from the left moves first in a normal field, then in a weaker field etc.

In the torpedo's head a coil rotates about a horizontal axis in the manner of an earth induction coil. At the terminals of the coil an e.m.f. is set up proportional to the vertical component of the magnetic field. An equivalent back e.m.f. develops in series so that no current flows so long as the torpedo is in a normal magnetic field. But when the torpedo comes to A, the magnetic field there is smaller and the e.m.f. on the coil decreases. The two opposing forces are no longer equal, and a current flows and activates a relay mechanism which initiates the fuze. The retardation is so adjusted that the explosion takes place immediately under the ship's bottom.

It is perhaps possible to protect oneself against such torpedoes by stretching a cable along the whole length of the ship, at about the level of the ship's hold and as far out from the ship's side as possible. Then if a suitably adjusted direct current is passed through this cable, it will create a magnetic field and will remove the danger point A to a position far outside the ship. The torpedo will then explode too soon. It is perhaps possible also by means of appropriately selected compensating coils to counter-balance the alteration of the magnetic field by the large mass of the ship.

□

ELECTRIC FUZES FOR BOMBS AND SHELLS

In Germany they are discontinuing the use of mechanical fuzes and going over to electric fuzes. All bomb fuzes are already electrical. Fig. 1. shows the principle. When the bomb leaves the aircraft the condenser C_1 receives a charge of 150 volts from a battery by means of a sliding contact. This condenser charges the condenser C_2 through a resistance R. C_2 becomes charged only when the bomb is at a safe distance from the aircraft. When the bomb touches the ground, a mechanical contact K closes, and the condenser discharges itself through the coil Z. The advantage is that the bomb can never be live while it is still on the plane, and thus a plane can be safely landed with a bomb load on board.

Fig. 2 shows an electrical time fuze. It is on the same principle, only instead of a mechanical contact it has a lamp G*, which lights after

* Text has 'Glimmlampe', ie glowlamp.

a fixed time interval. This time can be regulated through the condensers and resistances.

The newest development makes use of the lamps with grids, Fig. 3. If the battery voltage is so selected to be below the voltage of the fuze, and the grid is insulated, then, by altering the part capacities C_{12} and C_{23}, the lamp can be made to activate the fuze. Extraordinary small changes in the part capacities are all that are necessary. Fig. 4 shows how it is built into a shell. The head of the shell is insulated and is connected to the grid of the lamp. If the shell passes near to an aircraft the part capacities are somewhat altered and the lamp lights, whereby the shell explodes. The fuzes can be so set that all the shells will explode at a precisely determined height, eg three metres, above the ground.

I include herewith such a lamp and grid. There is an improved version with an annular grid.

The bomb fuze bears the number 25; production is expected to increase from 25,000 in October 1939 to 100,000 from April 1940.

These fuzes are being manufactured at Sömmerda in Thuringen on the railway from Sangershausen to Erfurt. The firm's name is Rheinmetall.